

## **APPARATUS FOR BLOCKING A MEDIUM FLOW PASSAGE IN A SPRAY HEAD, AND SPRAY HEAD**

### **Background of the invention**

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The present invention relates to an apparatus as defined in the preamble of claim 1 for blocking a medium flow passage in a spray head. The apparatus comprises a blocking element, such as a burst disk, arranged in the passage. When unbroken, the blocking element blocks the passage of medium flow from a first side of the blocking element to a second side of the blocking element. On the first side of the blocking element a first pressure prevails in the passage, while on the second side of the blocking element a second pressure prevails in the passage. The blocking element has been arranged to be ruptured so as to form a passage for the medium through the blocking element when the pressure difference between the first and the second sides of the blocking element reaches a preset value.

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The invention also relates to a spray head as defined in claim 7.

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In fire extinguishing technology, solutions are also known in which the flow passage of an extinguishing medium is provided with an element rupturable by the prevailing pressure (burst disk, rupture disk), placed between a liquid source and a spraying nozzle to block the passage. These are ruptured when the pressure difference in the passage on different sides of the burst disk exceeds a given value, which is characteristic to each burst disk. A solution of this type is described e.g. in the publication Fire Protection Handbook, 18th Edition, 1997, pages 6-200. Specification DE 19948324 discloses a corresponding solution. In prior-art solutions, the burst disk is so designed that it is bound to be ruptured when the pressure difference increases sufficiently. Therefore, incidental pressure variations occurring in the piping e.g. due to a malfunction may cause a rupture of the burst disk, which again results in significant extra costs. If the burst disk is so designed that it will not be ruptured until the pressure difference has reached a very high value, this may jeopardize reliable operation of the system in a fire situation. Solutions have therefore been developed in which the burst disk is rup-

tured by using separate devices to pierce the burst disk. These have not always been satisfactory in operation or they have been complicated and required energy from outside in order to work.

- 5 On the other hand, prior-art devices known in fire extinguishing technology include sprinkler heads provided with a valve element which in a non-activated state blocks the liquid flow passage and, when the sprinkler is activated upon being triggered, e.g. when a heat activated ampoule is broken, moves into a position where the extinguishing medium  
10 can flow into one or more nozzles. These solutions use dynamic seals, such as O-rings, to seal the space between the valve element and the flow passage wall in the non-activated state. A sprinkler head of this type, which uses ring-like seals, is disclosed in US patent 5,967,239 (Sprakel, et al.). In recent times there has appeared a need to avoid  
15 the use of dynamic seals in spray heads used for fire extinguishing purposes. In addition, the clearances between the valve element or shaft and the sprinkler body typically have to be made very small.

The object of the present invention is to achieve a completely new type  
20 of solution in conjunction with blocking elements to ensure their reliable operation. On the other hand, a second object is to achieve a compact solution in conjunction with spray heads to avoid the use of dynamic seals.

## 25 **Brief description of the invention**

The apparatus of the invention is characterized in that it comprises a supporting element arranged at least on that side of the blocking element where the pressure of the medium is lower at least just before the  
30 instant of rupture of the blocking element, which supporting element can be moved between at least two positions, a first position where the supporting element supports the blocking element so that the blocking element cannot be broken even if the pressure difference in the passage between the first and the second sides of the blocking element is  
35 greater than the preset value, and a second position where the supporting element does not support the blocking element.

The apparatus of the invention is additionally characterized by what is stated in claims 2 - 7.

The solution of the invention has numerous significant advantages. By providing an element supporting the blocking element, reliable rupture of the blocking element in a desired situation is achieved. By using a lockable supporting element arrangement, a reliable solution is achieved in which the supporting element is preserved in an unbroken state in desired situations. By providing a releasing element in conjunction with the supporting element, it is possible to accomplish a desired movement of the supporting element to the second position. By using a temperature-dependent releasing element, an excellent solution for use in fire extinguishing systems is achieved. By using the blocking system of the invention in conjunction with a spray head, an excellent solution for use in fire extinguishing systems is achieved, obviating the need for dynamic seals. In addition, the need to have small clearances between the shaft and the sprinkler head is eliminated, thus providing technical advantages in manufacture. At the same time, a very compact structure that does not take up much space and is very reliable in operation is achieved. By providing the sprinkler head with a regulating element, the supporting force can be adjusted as desired and, on the other hand, heat sensitive elements, i.e. triggering elements, such as ampoules, of different dimensions can be used in the sprinkler.

## 25 **Brief description of the figures**

In the following, the invention will be described in detail with reference to an example and the attached drawings, wherein Fig. 1 presents an apparatus according to the invention in conjunction with a spray head.

## 30 **Detailed description of the invention**

Fig. 1 presents an arrangement according to the invention in a simplified form. The solution comprises a medium passage 2, 3 in a spray head in which typically a first pressure  $p_1$  prevails when the spray head is in a state of readiness. The medium passage is provided with a blocking element 1, preferably a burst disk (rupture disk) or equivalent,

which in an unbroken state blocks the passage 2, 3. Arranged in the passage is a supporting element 4, which in the figure is placed on the opposite side 3 of the blocking element 1 relative to first pressure  $p_1$  of passage 2. The blocking element 1 and the supporting element 4 acting on it and a possible second pressure  $p_2$  together withstand the pressure  $p_1$  of the medium. When the supporting element 4 is released from its position supporting the blocking element, the blocking element 1 is broken, allowing the medium to flow in the medium passage to the second side of the blocking element.

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The blocking element is for example so designed that, without the supporting effect of the supporting device, it is bound to be ruptured by the action of the first pressure  $p_1$ . In an embodiment, the first pressure  $p_1$  is typically 4 - 25 bar.

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In an embodiment, the supporting element of the supporting device is e.g. a piston whose frontal surface in the position of readiness lies against the blocking element surface opposite the pressure. When the supporting device is activated and released from the supporting position, the piston will move away from its position supporting the blocking element, with the result that the blocking element is ruptured by the action of the first pressure.

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In the embodiment illustrated in the figure, the solution of the invention is applied in conjunction with a spray head, especially a sprinkler head used in firefighting. It is provided with a triggering device, e.g. an ampoule that is ruptured at a given temperature and in the ruptured state releases the supporting element of the supporting device from its supporting position to a second position, in which the supporting element does not support the blocking element surface intended to be ruptured.

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The apparatus for blocking a medium flow passage in a spray head comprises a blocking element 1 arranged in the passage, such as a burst disk, which in an unbroken state blocks the passage of medium flow from a first side of a blocking element to a second side of the blocking element. On the first side of the blocking element, a first pressure ( $p_1$ ) prevails in passage 2, while on the second side a second pres-

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- sure (p2) prevails in passage 3. The blocking element 1 has been fitted to be ruptured when the pressure difference between the first and the second sides of the blocking element reaches a preset value, a medium flow passage being thus formed through the blocking element. A supporting element 4 is provided at least on that side of the blocking element where the medium pressure is lower at least just before the instant of rupture of the blocking element. The supporting element 4 can be moved between at least two positions, a first position, in which the supporting element supports the blocking element so that the blocking element cannot be ruptured even if the pressure difference in the passage between the first and the second sides of the blocking element is higher than the preset value, and a second position, in which the supporting element does not support the blocking element.
- 15 The apparatus comprises means 5, 6 for locking the supporting element 4 in the first position. The apparatus comprises means 5 for releasing the supporting element 4 from the first position. In the embodiment illustrated in the figure, the means for locking and/or releasing the supporting element comprise a heat sensitive element 5. The heat sensitive element 5 may be e.g. an ampoule known in itself in firefighting, which breaks or melts at a given temperature. In the embodiment illustrated in the figure, the supporting element 4 is a piston element. The piston element 4 may be provided with one or more apertures 7 or channel parts designed to permit easier flow of the medium after the blocking element 1 has been ruptured. In the embodiment shown in the figure, the supporting element is provided with a shoulder 8 to cause the supporting element to be more effectively moved from the first position to the second position.
- 30 In an embodiment, the apparatus is fitted in a flow passage for a fire extinguishing medium in a fire extinguishing system. The apparatus is also particularly well applicable for use in systems using an aqueous liquid mist as an extinguishing medium.
- 35 The apparatus of the invention can be arranged for use in conjunction with a spray head, especially a sprinkler head.

The invention also relates to a spray head provided with an apparatus according to claim 1. If Fig. 1, the body 13 of the spray head is provided with a bore 3 which also functions as medium flow passage. From the bore a passage is further provided for at least one nozzle 12.

5 Formed in the body are screw threads 16 in which a sleeve 14 provided with bores 2, 15 can be secured. The bores 15, 2 serve as a medium flow passage into the spray head. Arranged in the bore 3 in the body is a shoulder 17, which again bears a blocking element 1, especially a burst disk or the like. The blocking element is preferably pressed in the

10 bore between the sleeve and the shoulder, so that when unbroken, it blocks the passage from the bore 2 in the sleeve into the bore 3 in the spray head body. Arranged in the bore 3 in the body is a supporting element 4, which in a first position supports the blocking surface of the supporting element 4. In the case illustrated in the figure, the support-

15 ing element is locked in the first position to support the blocking element by means of a locking device 5, 6. The supporting element consists of a supporting part 6 formed in the body, said part supporting means 5 for releasing the supporting element 4 from the first position. In the embodiment illustrated in the figure, the means for locking

20 and/or releasing the supporting element comprise a heat sensitive element 5. The heat sensitive element 5 may be e.g. an ampoule known in itself in firefighting and designed to be ruptured at a given temperature. Similarly, the heat sensitive element 5 may melt at a given temperature. Naturally, other types of devices for releasing the supporting ele-

25 ment may be used, so it is conceivable that they could work e.g. on the basis of a signal issued by the control system of a fire extinguishing system. Formed in the supporting element 4 is a bore 9 where the upper end of the ampoule as seen in the figure has been arranged to fit in. The total length of the ampoule 5 and the supporting element 4 has

30 been adjusted to be such that when the ampoule is in position, the supporting element is locked to support the blocking element 1 surface designed to be ruptured.

The supporting part 6 has preferably been arranged to be adjustable,

35 e.g. by means of screw threads formed in the body 13 and corresponding counter-threads formed in the supporting part 6. This allows, among other things, to adjust the supporting force applied to the blocking ele-

ment 1 to a suitable level or likewise to fit different heat sensitive elements 5 of varying dimensions, especially length, in the spray head. This also facilitates the installation work.

- 5 In the embodiment illustrated in the figure, the passage is somewhat wider in diameter on the side 3 of the supporting element 4 than on the side 2 beyond the supporting element, the blocking element having a counter-surface 1' for the supporting surface 4' of the supporting element, typically for its edges. The counter-surface 1' is typically a ring-  
10 like surface encircling the surface designed to be ruptured.

The general operation of the spray head of the invention will not be described in detail in this context, but its is assumed to be obvious to a person skilled in the art. In this connection, reference is made to US  
15 patent 6,318,474.

It is obvious to the person skilled in the art that the invention is not limited to the embodiments described above, but that it may be varied within the scope of the claims presented below.